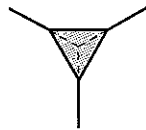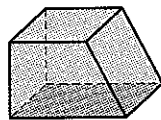# Activity 4.16 ◆
More Solid-Geometry Problems

### ◆ Questions About Polyhedrons

1. Each corner of a cube is cut off to leave an equilateral triangle as shown. How many faces does the new polyhedron have?

2. What is the shape of the base of this prism?

3. A space diagonal of a polyhedron is a segment connecting two nonadjacent vertices that do not lie in the same face of the polyhedron. How many space diagonals does a cube have?
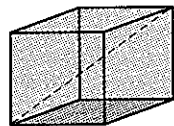
4. Each group of terms given next begins with a term in bold type. In each group, underline the terms that are examples or special cases of the term in bold type.

(a) **polyhedron:** prism, triangle, sphere, pyramid, lateral face, box, cookie tin.

(b) **3D shape:** hemisphere, prism, trapezoid, statue, picture, cookie tin.

5. Describe as clearly as you can what a prism is.

Your Description:

6. Jim made a prism by stringing together 18 straws. What kind of prism did it have to be?

Your Response:

7. Work with your group on this problem that involves antiprisms. Fill in the missing information about edges, faces, and vertices in the following table.

Antiprism	Bases	Edges	Faces	Vertices
Triangular antiprism	△			
Square antiprism	□			
Pentagonal antiprism	⬠			
Hexagonal antiprism	⬡			

(a) Write down at least three relationships that your group notices in the preceding table.

Relationship 1:

Relationship 2:

Relationship 3:

(b) How many faces does an octagonal antiprism have? How many edges does it have?

8. In the space provided, make a line drawing representing the solid described.

(a) A parallelepiped.

Your Drawing:

(b) A hexagonal pyramid.

Your Drawing:

(c) A pentagonal prism.

Your Drawing:

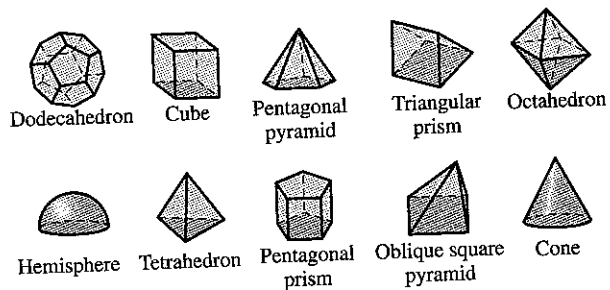**9. POSSIBLE?** For each of the statements that follow, decide whether it is possible.

◆ If it is possible, write POSSIBLE *and* draw a picture which shows that it is possible.

◆ If it is not possible, write NOT *and* give a reason that it is not possible.

(a) **POSSIBLE?** A pyramid with six faces.

(b) **POSSIBLE?** A prism with six edges.

(c) **POSSIBLE?** A polyhedron with four faces.

10. Name the figures shown that satisfy the descriptions that follow.

Dodecahedron Cube Pentagonal pyramid Triangular prism Octahedron

Hemisphere Tetrahedron Pentagonal prism Oblique square pyramid Cone

(a) This regular polyhedron has six vertices.

(b) The faces of this solid are five triangles and one regular polygon.

(c) One face of this polyhedron is a pentagon, and the polyhedron has 10 vertices.

(d) One cross section of this solid is a circular disk; another is a triangle.
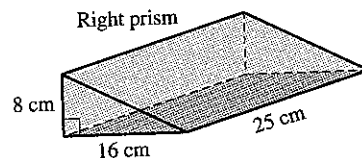
(e) This pyramid has five vertices.

◆ Volumes

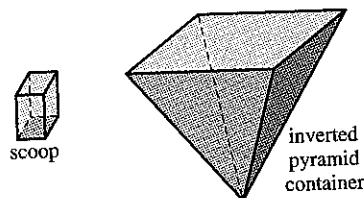**11.** Figure out the volumes of the two solid figures shown:

(a)

Rectangular pyramid

7 ft

5 ft

9 ft

(b)

Right prism

8 cm

16 cm

25 cm
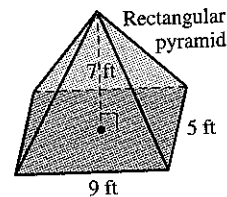
12. How many box-shaped scoops 2 in × 2 in × 3 in, are needed to fill an inverted pyramid shape that has a 1-foot-square base and is 1 foot deep?


scoop

inverted pyramid container

13. A *square dipyramid* is made by putting together the bases of two pyramids with a square base. If the square is 5 in on each side and the total height of the dipyramid (from apex to apex) is 8 in, what is the volume?
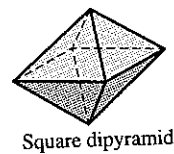
Square dipyramid

Activity 4.16 (Continued)

14. How tall is a box that holds 200 cubic inches and has a 5-in by 5-in square bottom?

15. A cathedral like structure has a square-shaped base 40 feet on a side, a height of 70 feet, and a hemispherical dome just fitting on the top. What is the volume of this building?

40 ft

70 ft

40 ft
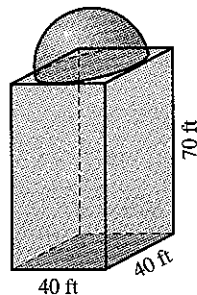
16. CONDITIONS? For each of the following statements, write a complete and true sentence containing the statement and describing conditions under which it is true.

(a) CONDITIONS?

Statement: *All faces except possibly one are triangles.*

Your Sentence:

(b) CONDITIONS?

Statement: *The volume is the area of the base times the height.*

Your Sentence:

(c) CONDITIONS?

**Statement:** *All of the faces of the polyhedron are regular polygons.*

Your Sentence:

(d) CONDITIONS?

**Statement:** *The number of edges is a multiple of 3.*

Your Sentence:

17. Jenny had a tall square-based pyramid made out of styrofoam. The base was 4 in by 4 in and the pyramid was 20 inches tall. She cut the top off as shown, so that it was 10 inches tall. What is the volume of the shape that Jenny ended up with?
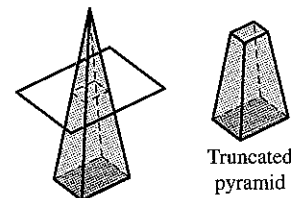
Truncated pyramid

Note: The kind of shape that Jenny ended up with is called *a truncated pyramid.* (Truncated means chopped off.)

18. What is the volume of a barn whose ends are in the shape of an isosceles trapezoid with dimensions as shown?

24 ft

10 ft

10 ft

14 ft
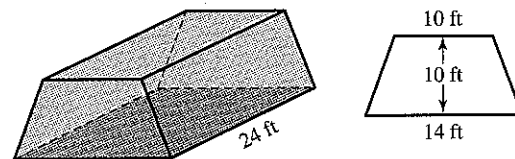
19. If the volume of a cube is 100 cubic inches, how long is each edge?

20. What is the volume of the elongated square dipyramid shown? The dipyramid is based on a square whose sides are 2 in. The length of the elongation is 3 in and the overall height of the solid is 7 in.

7 in   2 in   3 in